

Claims:

1. A process for generating heat from a carbon-containing material which includes the steps of:

(a) pyrolysing said material in a pyrolysis zone of a reactor at an elevated temperature to produce a carbon-enriched solid and a combustible gaseous product;

(b) burning a first part of said combustible gaseous product to produce a first gaseous combustion product and to heat said pyrolysis zone so as to maintain said elevated temperature;

(c) removing a second part of said combustible gaseous product from said reactor;

(d) burning said second part of said combustible gaseous product to generate heat and produce second gaseous combustion products; and

(e) returning said first and second gaseous combustion products to said pyrolysis zone.

2. A process according to claim 1 wherein said carbon-enriched solid is reacted with steam in said reactor to produce a mixture containing hydrogen and carbon monoxide.

3. A process for generating heat from a carbon-containing material which includes the steps of:

(a) pyrolysing said material in a pyrolysis zone at a first elevated temperature to produce a carbon-enriched solid and a first combustible gaseous product;

(a') transferring said carbon-enriched solid and said first combustible gaseous product to a reaction zone;

(b) reacting said carbon-enriched solid with water vapour in said reaction zone at a second elevated temperature to produce a second combustible gaseous product containing hydrogen gas and carbon monoxide;

(c) burning a first part of said second combustible gaseous product to produce first gaseous combustion products and to heat at least said reaction zone so as to maintain said second elevated temperature;

(d) removing a second part of said second combustible gaseous product from said reaction zone;

(e) burning said second part of said second combustible gaseous product to generate heat and second gaseous combustion products; and

(f) returning said first and second gaseous combustion products to said pyrolysis zone.

4. A process according to claim 3 wherein said pyrolysing step (a) and said reacting step (b) are carried out in the same reactor.

5. A process according to claim 3 wherein said water vapour is produced in said pyrolysing step (a).

6. A process for converting a carbon-containing material to a combustible gaseous fuel which includes the steps of:

(a) pyrolysing said material in a pyrolysis zone at a first elevated temperature to produce a carbon-enriched solid and a first gaseous product;

(b) reacting said carbon-enriched solid with water vapour in a second reaction zone at a second elevated temperature to produce a second gaseous product containing hydrogen gas and carbon monoxide;

(c) burning a first part of (i) said first gaseous product, (ii) said second gaseous product or (iii) a mixture thereof so as to heat at least said reaction zone and maintain said second elevated temperature; and

(d) removing the remainder of said first and second gaseous products as said combustible gaseous fuel.

7. A process according to claim 6 wherein combustion products from burning said first part in step (c) are returned to said reaction zone.

8. A process according to claim 6 wherein step (c) consists of burning a first part of said second gaseous product.

9. A process according to claim 6 wherein said reaction zone is at a temp in the range of about 315° to about 450°C.

10. A process according to claim 6 wherein step (c) consists of burning a first part of a mixture of said first gaseous product and said second gaseous product.

11. A process according to claim 6 further comprising passing into said reaction zone combustion gases produced from burning said first part of a mixture of said first gaseous product and said gaseous product in step (c).

12. A process according to any one of claims 1, 3 or 6 wherein said carbon-containing material includes municipal waste, sewage or a mixture thereof.

13. A system for recovering energy from carbon-containing material, the system including:

a reactor vessel having an exterior and an interior, said reactor being equipped with means to admit said carbon-containing material to the vessel and heating means to heat the vessel;

5 gas offtake means operatively associated with the reactor vessel to permit combustible gases generated in the vessel to be removed therefrom;

a first gas conduit between said gas offtake means and said heating means to transfer a first part of said gases generated in said vessel to said heating means;

ignition means adapted to ignite said gases in said heating means; and

10 energy recovery means operatively associated with the gas offtake means for recovery of energy from a second part of said gases generated in said vessel.

14. A system according to claim 13, wherein the first gas conduit includes gas separation means which is capable of separating at least part of any hydrogen present in the gases generated in the vessel from other gases present, thereby producing a hydrogen-rich stream and a hydrogen depleted stream, and means to transfer the hydrogen-depleted stream to the heating means.

15 15. A system according to claim 14, further comprising a second gas conduit between said heating means and said reactor vessel, to transfer gaseous combustion products from said heating means to the interior of said vessel.